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Solar Based Multipurpose Agriculture Robot

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ABSTRACT: This paper represents the design, fabrication, and development of solar operated agriculture robot. The robot can dig the soil, feed the seed, leveler to close the soil, and pump to spray the fertilizer. These all system works on battery and solar power. Vehicle is to be controlled with help of remote. Approximately 50% of people in India work in agriculture sector. In this agriculture sector there is a lot of field work such as digging, harvesting, sowing, weeding, etc. And spraying is also an important operation in agriculture. Which to be perform by the farmer, to protect the crop form the pest, funguses and any other diseases. It is concept of investigating multi-purpose small machine which is more efficient than the large tractors and human forces. Due to this purpose, we design and developing such a system with the following feature. Harvesting is the first step in farming after the completion of this step land is ready for the seed sowing, spray pump is used to spray the fertilizer.

KEYWORDS: Solar panel, Battery, DC motor, Digger, Lead screw

I. INTRODUCTION

Indian economics base on agriculture field development in agriculture lead to raise to economic status of country. In India farmer are facing problem due to unavailability of labor. Also, traditional way of farming equipment which takes lots of time and it also increases labor cost. The idea of applying robotic technology in agriculture is very new. In agriculture the opportunities for robot enhanced productivity are immense and the robot is appearing on the farm in increasing number. We can expect the robot performing agriculture operation autonomously such as mechanical weed control, digging, weeding, seed sowing, and spraying.

The automation in agriculture could help to framers to reduce their effort and their working time the automation in agriculture filed could be more effective and efficient as compare to tradition methods of framing. So,our focus will be on reduce labor cost, daily working hours, environmental all impact and safety issues and most important is to reduce framer effort.
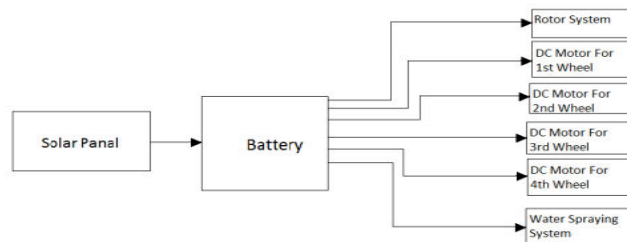
II. METHODOLOGY

Fig 1. Block Diagram of system

The aim of our project is design and develops a multipurpose robot, which is used to reduce time and human effort. The operations are carried by a robot are harvesting, digging, seed sowing and leveling to close the soil and also sprayer to spray a fertilizer. These all operations are performed by using the battery and solar power.

- The frame of robot is made of Mild Steel (MS). The four wheels are connected to the frame, which are driven by using a DC motor.

- The front of frame harvester rotor is connected and this rotor is rotate by using DC motor.
- On the middle of frame three diggers are connected to dig the soil. The nut and bolt arrangementare used in the robot, by using nut and bolt up and down position of digger is done.

III. OBJECTIVES

The objective of this paper is to present robotic model which is easily operates agriculture operation.
- Now a days it is necessity of automation in agricultural field to reduce the farmers efforts & labor cost.
- To perform all operation. Like weeding digging seed sowing & spraying at a single time hence increase production & saves time.
- The farmer can operate robot very easily.
- Large amount of work completes in less time.
- For battery charging solar energy is to be used. The rays of the sun can be used for solar power generation.

IV. PROPOSED DESIGN OF MULTIPURPOSEAGRICULTRAL ROBOT
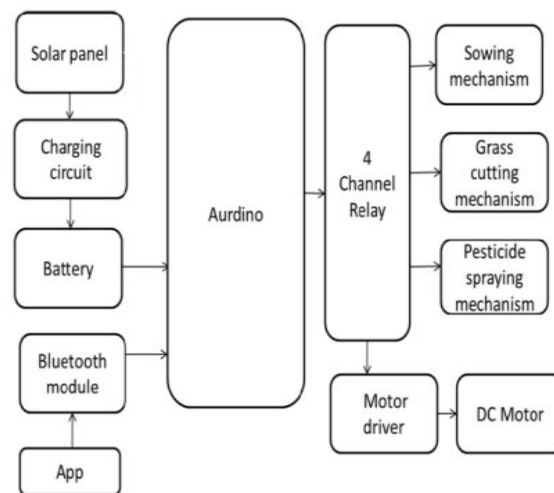
Multipurpose agricultural robot is shown in Fig.1.
Fig.. Block diagram of the Automated Seed Sowing, Grass Cutting and Pesticide Sprayer Robot Using Bluetooth/Android App.

The block diagram consists of Arduino microcontroller which is controller for the whole system as shown in Fig.1 and solar panel is connected to the battery for storing energy and further it is given to power supply charging circuitry which is providing +5 V for Arduino board and +12 V supply for driving DC motors using L298 motor driver module. Bluetooth HC05 is connected with Arduino and wirelessly with Android smartphone to controlling the whole system.

A. Arduino Microcontroller (ATmega328)
Arduino Atmega328 microcontroller as shown in Fig. 2 is used to command the various components. TheArduino atmega328 microcontroller and its architecture is shown in Fig. 2. The Atmega328 microcontroller has 28 pins. It has 13 I/O digital pins, of which 5 can be used as PWM outputs and 5 as
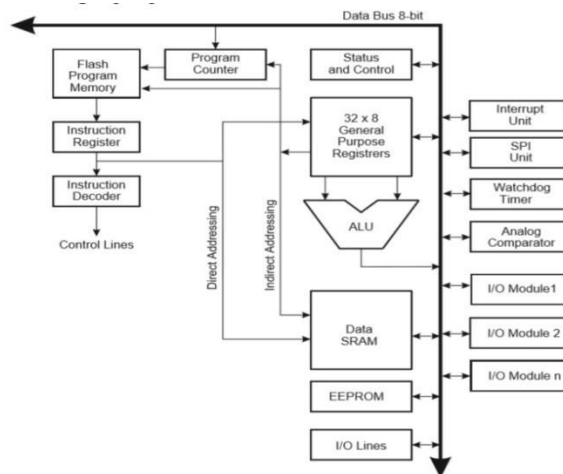
Fig.2. Architecture of Arduino Atmega328 microcontroller.
analog input pins.

B. Solar Panel

The solar cells that are seen on satellites and calculators are also called photo Voltaic(PV) cells as shown in Fig.3, which as the name implies (photo meaning \light" and voltaic meaning \electricity"), convert solar energy directly into electrical energy. A module is a group of cells which is electrically connected and packed into a frame (most commonly referred as solar panel). Solar panels are a great way to cut your electricity that everyone wants to live on their own or at least reduce our home's carbon footprint, and solar panels make this dream possible. Solar panels are made of photovoltaic a (PV) cell, which converts sunlight into electricity.

C. Bluetooth Module HC-05

HC05 module is pretty easy to use and Bluetooth Serial Port Protocol (SPP) module is fabricated for transparent wireless serial connection setup. The HC-05 Bluetooth module can be used to communicate between two microcontrollers like Arduino or communicate with any device with Bluetooth functionality like a Phone or Laptop and is shown in the Fig.4. To control the entire system, Bluetooth HC05 is connected to Arduino and to android smartphone wirelessly. pairing the HC05 module with microcontrollers is very easy because it works using the SPP.
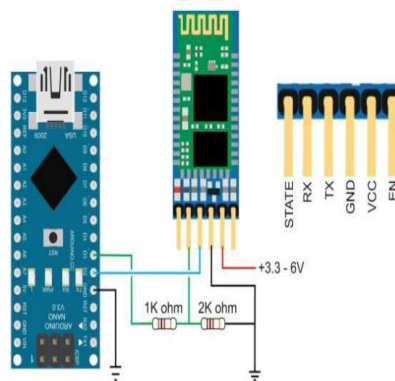

Fig.4. Interfacing relay with Arduino.

D. Motor Driver IC L293D

The motor driver is a module for motors that allows to control the working speed and direction of two motors simultaneously. The motor driver is designed and developed on the basis of L293D IC. L293D is a 16-pin motor driver IC as shown in Fig.5. It provides bidirectional drive currents at voltages ranging from 5 V to 36 V. The L293D is an IC with eight pins on each side to control two DC motors simultaneously. It consists of 4 input pins, 4 output pins and 2
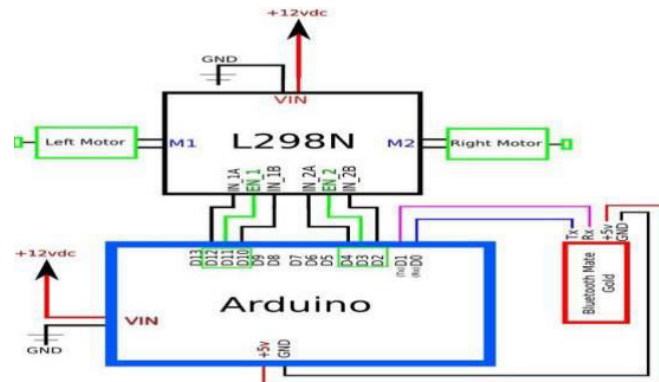
Fig.5. Interfacing Motor Driver with Ardunio.

enable pins for each motor.

E. Relay

A relay is an electrically operated switch as shown in Fig.6. It uses an electromagnet to operate mechanically as a switch, but other operating principles are also used such as solid-state relays. Relays are used by a separate low-power signal to control a circuit, or by a single signal to control multiple circuits. Relays were used extensively to perform logical operations in telephone exchanges and early in computers.
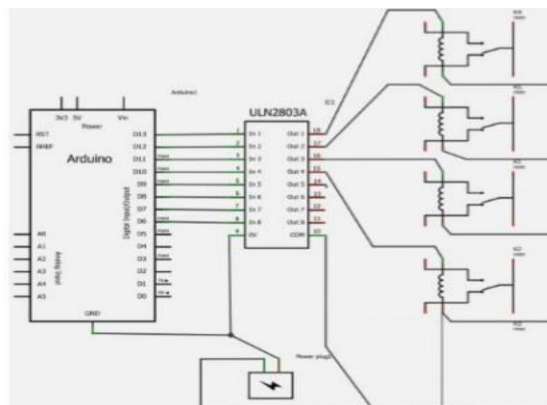

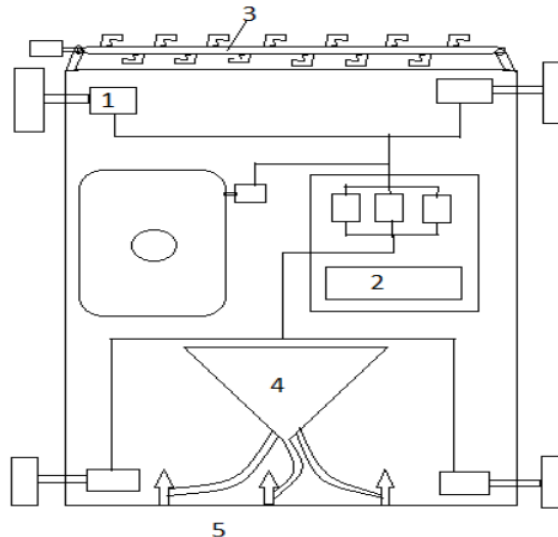Fig.6. Interfacing relay with Arduino

V. OPERATIONS

Fig. Schematic sketch of Agriculture Machine

1-DC motor
2-Battrey
3-Rotor
4-Funnel
5-Diggers

Weeding Operation: -
Weeds are plants that growing places where they are not wanted. Theycan be cause damage because the crop is not ventilated well. And there is more chance on fungal attack. A small rotor on which the curve shape blades are mounted to remove the weeds from soil. This rotor is operated by using a DC motor. Weeding refers to the removed of weeds. Weeding only affects the soil minimally, which is beneficial to clear huge amounts of plants. Weeding is generally done manually rather than with mechanized equipment and also done regularly.

Digging Operation: -
There are three diggers are used in digging operation. The diggers are mounted on the middle of the frame. Digger mechanism is used to digging and seed sowing. All the diggers are adjustable the diggers are connected to the frame by nut and bolt arrangement. Holes are produced on the diggers. The funnel and diggers holes are connected by using the hoses.

Seed sawing Operation: -
Seed saving is the process of planting seed. Tradition method of seed sawing based on assumption of seed-to-seed sparing & depth of placement which is not efficient & it required lot of timed effort to. Some time it results in backache of farmer.

Leveling Operation: -
A sheet metal plate is used as soil closer & leveler. The material of sheet metal plate is mild steel. An arrangement of nut & bolt is used for sheet metal plate up & down movement. The leveler is fixed to the frame which closes the soil in the sowed soil & level the land.

VI. MATERIAL AND COMPONENTS

Materials used to conduct the present research are Cast iron for Frame
➢ Mild steel for Diggers
➢ DC motors
➢ Solar panel
➢ Wheels
➢ Battery
➢ Funnel and hoses
➢ Sprayer and Nozzle

VII. PROJECT DESCRIPTION

The main impact for our project has been to develop a solar operated multi-purpose machine, which is solar powered. In this machine, we used a solar panel to capture and convert solar energy into electrical energy which is used to charge a 5V battery, which gives the necessary power to a DC Motor. With the help of Bluetooth, we connect all the commands through our mobile phone. This power is transmitted to the rear wheel through gears. In this project it makes the electrical and mechanical systems share their power in efficient way. It reduces the running cost of digging machine. Multi-purpose agriculture robot can perform the following functions:

• Robot vehicle can dig the soil, put the seeds and spray the water
• To reduce human effort in agriculture field.
• To perform all three operations at single time, hence increases production and saves time.
• Farmers can operate this robot through smart phone by sitting at a place and can easily operate.
• To increase the efficiency the solar power is used and the power output can be increased.

VIII. FUTURE SCOPE

With fully-automated farms in the future, robots can perform all the tasks like mowing, fertilizing, monitoring of pests

and diseases, harvesting, tilling, etc. This also enables the farmers to just supervise the robots without the need to operate them. In future robot also runs on PLC and SCADA with fully automated.

IX. PROTOTYPERESULTS AND DISCUSSION

The designed robot will perform the seed sowing, pesticide spraying and grass cutting operations simultaneously. When the solar panel gets heated it converts sunlight into electricity. This electrical energy is fed into the charging circuit. The motor driver is used to drive the DC motors which run the robot. The model consists of android app and Bluetooth HC-05 to transmit and receive the signals respectively. The robot waits until it gets signals from app. When the signal is received, the respective operations will be activated and robot will work accordingly. The prototype has the different output sections and the main idea of the work is fulfilled. Fig.8 shows the entire prototype of the automated multipurpose robot which is controlled through app. It performs seed sowing, grass cutting and pesticide spraying simultaneously on all the types of farming land.
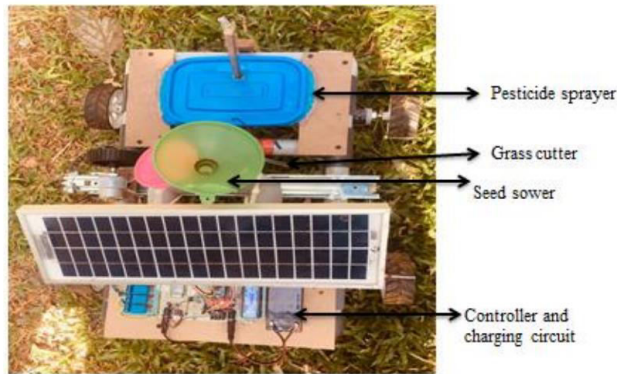

Fig.8. Snapshot of the Automated Seed Sowing, Grass Cutting and Pesticide Sprayer Robot Using Bluetooth/Android App.
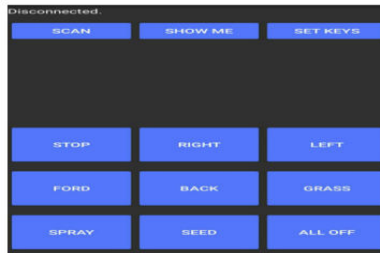

Fig.10. Snapshot of Bluetooth/Android App.

X. CONCLUSION

In agriculture, by using the solar operated multi-purpose robot. We can easily reduce the farmer efforts and time. The machine required less man power and less time compared to traditional method. We hope this will satisfy the partial thrust of Indian agriculture. So, in this way we can overcome the labor problem that is the need of today's farming in India. In future the robot also runs on PLC and SCADA with fully automation.

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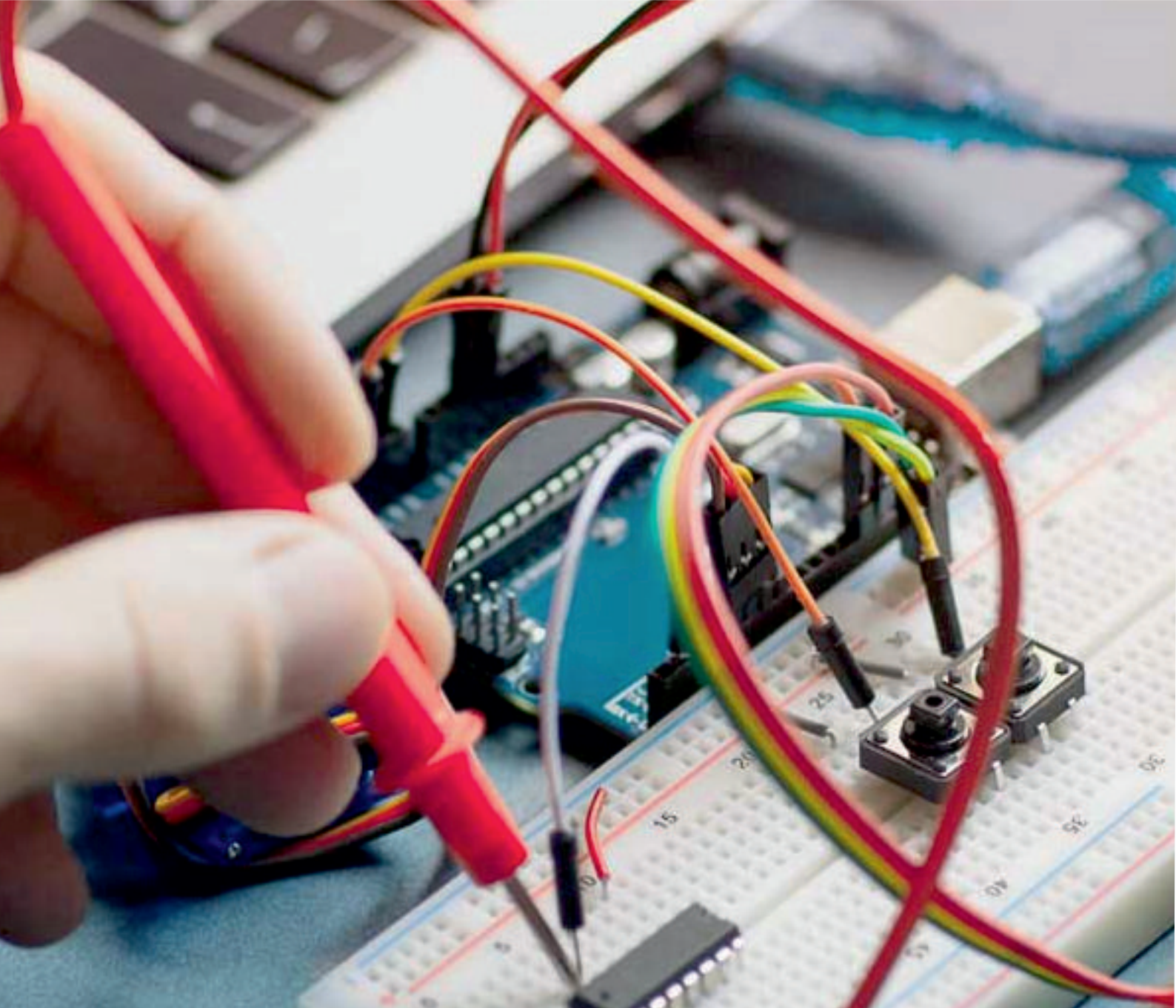
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